Exercices (1*st* Day)

(Getting familiar with MATLAB: Basic operations)

Exercise 1: Load the image "Day1/Udo.png" into MATLAB and visualize it. Now perform the following operations:

1. Flip the image around the horizontal axis.
2. Set all values in the G-channel to zero.
3. Flip the lower left quarter of the image around the vertical axis.
4. Extract the upper right quarter from the original image, set all B-values to 255 and replace the upper right quarter of the image from 3) with the result.

After each step, save the resulting images to disk.

useful functions:
`imread, imshow, imwrite, cat, ones, floor, ceil`

Exercise 2: Open the grey value image "Day1/lenaGr.png" and display it. Compute and visualize the histogram. Aim for an (approximate) equal distribution of the grey values (histogram linearization). Compare the histograms and images. To this purpose, also compute the mean value and variance of the grey values. What is the effect of the histogram linearization?

useful functions:
`figure, sprintf, histeq, mean, var`

Exercise 3: Write a MATLAB-Function (m-File) that generates and visualizes a chessboard-pattern of arbitrary size. Image size and chess field size should be adjustable via function parameters. Take care that, in case of errors, appropriate error messages are shown. Make sure that the image dimensions always are a multiple of the chess field size, and set the image size (given by the function parameter) to the nearest adequate value if necessary.

Change your function to generate triangles instead of squares for the black fields.

useful functions:
`zeros, repmat, round`

Exercise 4: Open the image "Day1/bunt1.png". Perform a color space transformation to HSV. Use the following formulae:

$$MAX = max(R,G,B), MIN = min(R,G,B)$$

$$H = \begin{cases} 0 & : \quad MAX = MIN \\ (0 + \frac{G-B}{MAX-MIN}) \cdot 60 & : \quad R = MAX \\ (2 + \frac{B-R}{MAX-MIN}) \cdot 60 & : \quad G = MAX \\ (4 + \frac{R-G}{MAX-MIN}) \cdot 60 & : \quad B = MAX \end{cases} \qquad if \quad H < 0 \quad H = H + 360$$

$$if \quad MAX = 0 \quad S = 0 \quad else \quad S = 100 \cdot \frac{MAX - MIN}{MAX}$$

$$V = 100 \cdot MAX$$

Now, try to extract the blue, red and skin-colored areas using appropriate color thresholding. Would you expect this to work well in RGB space? Why?

useful functions:
`max, min`